

Wild Birds Help Scientists Understand West Nile Virus



***N*ational West Nile Virus surveillance primarily utilizes the testing of dead birds to detect the presence of the virus. Effective surveillance depends on an educated public to report or collect dead birds, primarily crows. Individuals can call their local or state WNV hotline or health department for additional details. Information on WNV in dead birds is used by local health agencies to determine public health risk and make decisions about mosquito control.**

Since the fall of 1999, USGS has been testing wild birds and mammals for West Nile virus (WNV) infection and incorporating epidemiological data on West Nile outbreaks into a geographic information system (GIS) for display and analysis. West Nile is an insect-borne virus that had never been reported in the Western Hemisphere prior to 1999. Birds are the natural hosts for the virus, which can be transmitted from infected birds to humans and other animals through the bites of infected mosquitoes. Wild birds, primarily crows, were affected in the initial outbreak in the greater New York City area; horses and people were also infected. The virus caused encephalitis in 62 people in the New York City area, seven of whom died. To date, the virus has been found in 82 bird species, including 62 free-ranging species from 13 states extending from Vermont to Florida.



A USGS pathologist examines a suspect West Nile Virus Crow.

In the year 2000, wild bird mortality due to WNV was first detected in May in southeastern New York and northeastern New Jersey. The disease expanded both geographically and in the number and variety of species infected. In addition to the 82 bird species noted earlier, 4 free-living wild mammal species in New York were found positive for WNV for the first time, and the virus was once again reported in horses, causing illness in 65 horses from 7 states. Nineteen people were diagnosed with the disease and there were two fatalities.

Surveillance efforts detected a number of positive mosquito species, including species active at dawn and dusk and species active during the day. The mosquitoes found positive include species that feed on both birds and mammals.

In September 2000, USGS alerted Federal and State wildlife and conservation agencies that the fall migration of millions of birds through the 500-mile-wide region where infection had occurred would probably move the West Nile virus farther south into the Atlantic and Gulf coast states.

Wild bird mortality has been an accurate indicator of the extent of WNV, and it continues to provide an early warning system for the emergence of the virus in new locations. The probable dissemination of the virus along migratory corridors offers new challenges for both public health and wildlife disease specialists. Wildlife involvement in

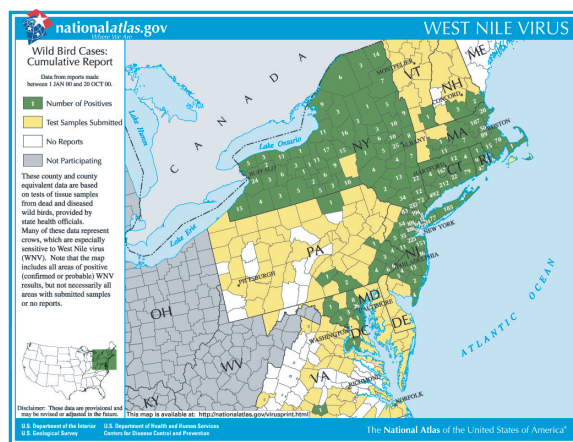
expanding WNV activity in the United States has become more intense and complex with the increasing number and variety of bird species that are testing positive.

In 2001, WNV transmission was detected 2-3 weeks earlier in the spring and was noted in 5 separate geographic locations, or foci. This finding suggests that further geographic expansion is likely.

Wildlife disease scientists from the USGS National Wildlife Health Center (NWHC) are continuing to provide diagnostic support to Federal, State, and local wildlife agencies, as well as to public health departments and other Federal agencies that are utilizing dead wild birds as sentinels for detecting WNV. Monitoring the geographic expansion of the virus is critical: active surveillance is ongoing in collaboration with the U.S. Department of Agriculture, the U.S. Fish and Wildlife Service, the National Park Service, and State wildlife agencies. Free-ranging wild bird populations throughout the eastern United States are being sampled.

Scientists in the USGS Geographic Sciences Branch are providing the Centers for Disease Control and Prevention, as well as public health agencies, with a GIS incorporating Landsat 7 Thematic Mapper imagery, land-use and land-cover data, roads, and hydrography. These data are being used by scientists in the field to identify bird and mosquito habitat and to determine the best locations for placement of mosquito traps.

Information from the National West Nile Virus Surveillance System is being used to compile and produce graphical displays and animations showing the pattern and spread of the virus. An additional analysis is being performed to detect clusters of infections and, possibly, the geographic origin of the outbreak. Maps documenting West Nile virus activity in 2000 are available through the National Atlas of the United States. Maps documenting 2001 activity are available through the Center for Integrated Natural Disaster Information.



This map shows the cumulative number of wild bird cases of West Nile Virus between January 1, 2000 and October 20, 2000. Counties in green are those in which wild birds tested positive for the virus. National Atlas maps showing surveillance plans, species affected, and location of positive animals for the year 2000 can be found at www.nationalatlas.gov/virusmap.html.

USGS is working with the Centers for Disease Control and Prevention to learn the current geographic extent of WNV, to understand how it moves between birds, mosquitoes, and humans, and to predict future movements of the virus. The 3-year study utilizes active wild bird surveillance along the Atlantic Flyway, with simultaneous collection of mosquitoes, to detect the presence of WNV. USGS is working with the U.S. Fish and Wildlife Service, the National Park Service, and other Federal agencies to identify appropriate sampling sites, including a survey of over-wintering birds at sites in Florida. This system, based on the ubiquitous presence of birds and their potential exposure to disease, will indicate the diffusion of pathogens across eastern America and provide a mechanism to detect novel pathogens in the environment, determine their geo-

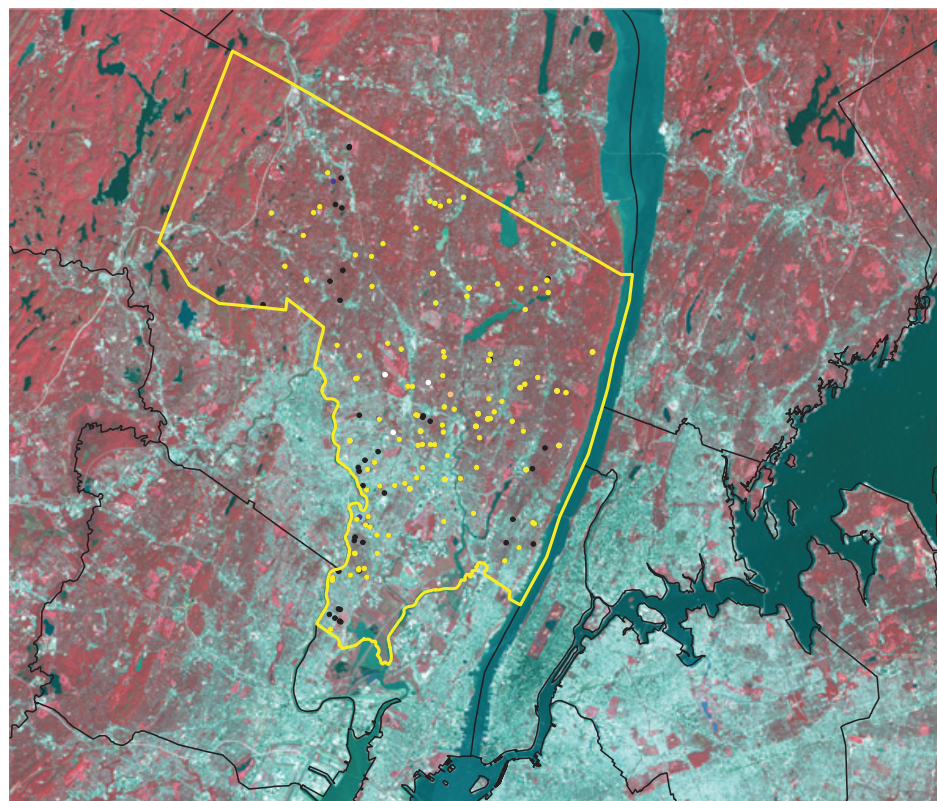
graphic extent, and identify their relationship to the landscape and the environment.

The surveillance system will provide basic information on the geography of WNV. The combination of this data with information about landscape characteristics and weather conditions, over space and time, will provide the foundation for developing spatial analytical and forecasting models. Hypotheses about the necessary precursor conditions of landscape and weather that enable outbreaks can be formulated and tested.

USGS is using its Biological Safety Level 3 containment facility in Madison, Wisconsin, to conduct research studies to determine the virulence of WNV in crows, waterfowl and other species. The fatality rate in captive crows experimentally inoculated with WNV

was 100%. Additionally, USGS scientists recently reported that in a confined experimental setting, West Nile virus could be transmitted from crow-to-crow. It had been thought that the virus was transmitted only through the bite of a mosquito.

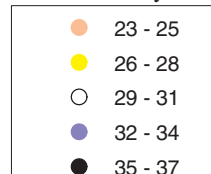
For more information on the West Nile virus you can access the USGS Center for Integrated Natural Disaster Information website at cindi.usgs.gov/hazard/event/west_nile/west_nile.html (2001 maps), the USGS National Atlas web site at www.nationalatlas.gov/virusmap.html (2000 maps), or the USGS Wildlife Health site at www.nwhc.usgs.gov. Otherwise you may contact: Dr. Robert McLean, USGS National Wildlife Health Center, (608) 270-2401, or Dr. Stephen Gupitill, USGS, Geographic Sciences Branch, (703) 648-4520.



The precise location of West Nile Virus-positive crows enables geographic analysis of the West Nile Virus outbreak.

Bergen County, New Jersey
West Nile Virus Outbreak
157 confirmed avian cases
May 30 - September 7, 2000
Landsat 7 Satellite Imagery
Acquired September 23 and October 2, 1999
Data Sources
Bergen County Department of Health Services
Centers for Disease Control and Prevention
U.S. Geological Survey

Avian Cases by Week



0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers



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